

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 3-17								
		<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060	Contract Period 09/30/2012 To 09/29/2016 Base Option Period Number 3	Title of Work Assignment/SF Site Name Big Spring Run Watershed Model								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW 2a and c								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval		Period of Performance From 01/04/2016 To 03/31/2016								
Comments: Full Title: Big Spring Run Watershed Modeling Hydrology & WQ										
<div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund </div>										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO <input type="checkbox"/> (Max 2)										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE:						
09/30/2012 To 09/29/2016										
This Action:										
Total:										
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee				LOE:		
Cumulative Approved:				Cost/Fee				LOE:		
Work Assignment Manager Name Tim Canfield							Branch/Mail Code:			
<div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>(Signature)</div> <div>(Date)</div> </div>							Phone Number: 580-436-8535			
							FAX Number:			
Project Officer Name Ruth Corn							Branch/Mail Code:			
<div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>(Signature)</div> <div>(Date)</div> </div>							Phone Number: 513-569-7920			
							FAX Number:			
Other Agency Official Name							Branch/Mail Code:			
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							FAX Number:			
Contracting Official Name Mark Cranley							Branch/Mail Code: CP0D			
<div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>(Signature)</div> <div>01/07/2015</div> </div>							Phone Number: 513-487-2351			
							FAX Number: 513-487-2109			

PERFORMANCE WORK STATEMENT
CONTRACT NUMBER: EP-C-12-060
WORK ASSIGNMENT NUMBER 3-17

TITLE: Modeling hydrology and water quality in predominant agricultural regions with emphasis on the Big Spring Run watershed in Lancaster, PA.

EAS Short Title: Big Spring Run Watershed Modeling Hydrology & WQ

WORK ASSIGNMENT COR (WACOR)

Timothy J. Canfield
R.S. Kerr Environmental Research Center
919 Kerr Research Drive
Ada, OK 74820
580-436-8535 Ph.
Canfield.tim@epa.gov

PERIOD OF PERFORMANCE

Work Assignment (WA) initiation through March 31, 2016

INTRODUCTION & BACKGROUND

The Conestoga watershed contributes a significant amount of water and sediment annually to the Chesapeake Bay, a water body that has been listed as impaired under the Clean Water Act since 1998. The water quality concerns for the Chesapeake Bay has attracted federal, state, environmentalists, academics and others to the area to employ their expertise for developing and evaluating mitigation strategies for improving and sustaining the improvement of water quality in the Bay. The work is scattered throughout the watershed and involves everything from management, vegetative, and structural Best Management Practices (BMPs). One research project geared at evaluating a stream restoration effort that employs both the vegetative and structural aspect for reducing stream sediment loss and improving water quality within the Conestoga watershed has gotten national attention because it involves a comprehensive approach to evaluating stream restoration. The study sites includes Big Spring Run (BSR) in Lancaster, PA, which is being evaluated for the effect of the BMP on ground water and surface water quality and quantity, nutrient transport and speciation, biological impacts, physical and mechanistic dynamics of the systems.

The State of Pennsylvania through its commitment to the Chesapeake Bay council set milestones in 2012 to reduce nitrogen, phosphorus and sediment loads to the Chesapeake Bay by approximately; 6.3 million, 0.2 million, and 204 million pounds respectively in the year 2013 (PDEP, 2012). The research at BSR was initiated for conducting pre and post BMP implementation or (stream restoration) evaluations including hydrology, ecological functions, and nutrient dynamics. The site was the location of an historic milldam. Milldams were used between 1600s and 1900s for power generation and occurred in the highest densities along eastern streams within the states of Maryland, Pennsylvania, New York and central New England and are believed to have resulted in the settlement of fine sediment over resettlement wetlands (Walter and Merritts, 2008). These legacy sediments are highly erodible and can cause between 50 to 80 percent of suspended sediment loads in watersheds in Pennsylvania and Maryland (Walter et al., 2007). The work conducted at BSR will hopefully give needed information on the effectiveness of the BMP for improving water quality and reducing sediment loads. Work done at BSR will contribute significantly to our understanding of the efficacy of structural BMPs. The capability for modeling the study conceptually and showing how restoration could impact sediment delivery and hydrology at a watershed scale will provide useful information for conservation practitioners and others.

Modeling watersheds as an approach for evaluating the impact of BMP implementation has become increasingly relevant due limitations for conducting long-term extensive monitoring. Watershed scale models have been applied to evaluate various aspects of non-point source pollution and to a lesser extent impacts of structural BMPs. Field evaluation of structural BMPs at this scale can be extremely costly. Though watershed models cannot account for every detail, they are a good source for evaluating the targeted systems at work and the dynamics between and within those systems.

The Soil and Water Assessment Tool (SWAT) was developed by the United States Department of Agriculture (USDA), the Agricultural Research Service (ARS) for conducting long-term, continuous, watershed level simulations used for predicting the impact of land management

practices on water quality and quantity for variety of soils, land cover and management practices (Arnold et al., 1998). SWAT is a physically based model with the capability for efficiently simulating high levels of spatial detail and requires input of weather, hydrology, soil properties, vegetation, and land management practices (Jha, et al., 2007). SWAT has been tested extensively across the US and internationally for evaluating non-point source pollution, conservation practices, and land use management among others. The model has also been used for watershed studies within the Chesapeake Bay area (Chu et al., 2004; Meng et al., 2010; Sexton et al., 2010; Veith et al., 2010) for evaluating water quality and quantity concerns, and is part the Chesapeake Bay Forecast System (CBFS) being developed by the University of Maryland at College Park and the National Oceanic and Atmospheric Administration (NOAA) to provide real time simulations of the Bay (Meng et al., 2010).

Hydrology in SWAT is based on a water balance that includes surface runoff, precipitation, percolation, lateral subsurface flow, groundwater return flow, evapotranspiration, and channel transmission loss subroutines. Surface runoff is estimated based on land use, antecedent moisture conditions and soil type using the SCS curve number method (Neitsch, et al., 2011); another option is using the Green-Ampt (Green and Ampt, 1991) for estimating surface runoff and infiltration, however this method requires sub daily weather data.

SWAT transports sediment through a land component and a channel component (Neitsch, et al., 2011). Within the land component the model estimates soil erosion and sediment from hill slope erosion using the Modified Universal Soil Loss Equation (MUSLE) (Williams, 1975; Williams and Berndt, 1977) and transport sediments based on particle size distributions and routes them through surface water sources and channels (Neitsch et al., 2011). Channel sediment routing includes within stream depositional and degradation processes that are dependent on stream power, channel surface exposure and channel bank and bed composition (Neitsch et al., 2011); that are determined using the modification of Bagnold's sediment transport equation (Bagnold, 1977) and Stokes's law (Chow et al., 1988) to estimates transport concentration capacity as a function of flow velocity.

PROJECT OBJECTIVES

For this WA, the contractor shall finalize the report on the modeling results from option period 2 that provided GIS and modeling support for developing ground water models as part of a project on Big Spring Run in Lancaster County Pennsylvania. This effort was used to evaluate hydrology and produce ground water flow models useful in describing the effects of restoration at multiple spatial scales.

Ground water and surface water hydrology are critical components of an ecosystem's services and functions, and the fate and transport of environmental stressors through these hydrologic pathways are of vital importance to scientists, regulatory bodies and policy makers. Accordingly, there is an increasing need for all-inclusive studies that capture multiple aspects of ecological problems; for example flow patterns and stressor pathways. The quantity and quality of data needed to characterize all aspects of transport pathways for a specific stressor is time and cost prohibitive. The main objective of this study was to apply and test SWAT for estimating the

changes in sediment loads and discharge for post-restoration scenario in the BSR watershed. The objectives of this research were: (a) to parameterize and calibrate ground water and surface water hydrology models for describing the fate and transport of targeted aquatic stressors, especially nitrogen, at varying spatial scales and (b) the calibrated model(s) will then be used to predict the effect of legacy sediment removal on hydrology at BSR and the subsequent effect on nitrogen flux in the BSR watershed.

TASK DESCRIPTION OBJECTIVES

- Provide a comprehensive written final report of modeling results and GIS developed from the project data to be delivered to EPA WACOR and Task Lead.

QUALITY ASSURANCE

This work shall be done in accordance with a Quality Assurance Project Plan (QAPP) submitted by the contractor and approved by the EPA in response to this work assignment. The QAPP will include requirements for data quality. A copy of GWERD QAPP will be provided to the contractor as reference material for the development of the contractor QAPP. This effort shall continue in WA 3-17. All elements should be the same as contained in WA 1-17 and WA 2-17 as this work is still current. No modifications to the QAPP are necessary.

TASK 1: Summary of findings from the SWAT model runs regarding the effects of the restoration on the hydrology of Big Spring Run in Lancaster County PA. This effort shall continue in WA 3-17. All elements should be the same as contained in WA 1-17 and WA 2-17 as this work is still current. This effort is focused on incorporating the final review comments into the report, producing the report and providing the report and all data and files back to the EPA WACOR and Task Lead.

The contractor shall provide a written summary of the results of the SWAT modeling and G-Flow modeling for the Big Spring Run watershed in the form of a final report. Data tables with the pertinent information for these watersheds will be developed and presented in the summary report. Files of all tables and graphs will be supplied to the EPA Task Lead and EPA WACOR in the original format that they were developed as well as in the summary report. Detailed documentation of all aspects of modeling work should be kept and submitted with all electronic files at the completion of the work.

Proposed timeline for this Work Effort (Revised)

TASK	SUB-TASK	MILESTONE	TIMELINE
1		A comprehensive final written report identifying the effects of the restoration on the hydrology of Big Spring Run	By March 31, 2016

Reporting

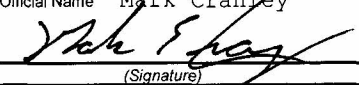
All documentation and reporting under this work assignment shall be in compliance with contract requirements.

Technical Direction

The WACOR is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the CL-COR and CO for their information and necessary actions. The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract. Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables.

References

- Arnold, J. G., Srinivasan, R., Muttiah, R. S., & Allen, P.M. (1998). Large area hydrologic modeling and assessment part I: Model development. JAWRA Journal of the American Water Resources Association, 34(1), 73-89.
- Bagnold, R. A. (1977). Bed load transport by natural rivers. Water Resources Research, 13(2), 303-312.
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- Meng, H., Sexton, A. M., Maddox, M. C., Sood, A., Brown, C. W., Ferrara, R. R., & Murtugudde, R. (2010). Modeling Rappahannock River Basin Using SWAT—Pilot for Chesapeake Bay Watershed. Applied engineering in agriculture, 26(5), 795.
- Neitsch, S. L., Arnold, J. G., Kiniry, J. R., Williams, J. R., & King, K. W. (2011). Soil and water assessment tool theoretical documentation, version 2009. Texas, USA.
- Pennsylvania Department of Environmental Protection (PDEP), 2012. PA Final 2012-2013 Milestones;
http://www.portal.state.pa.us/portal/server.pt/community/chesapeake_bay_program/10513
- Sexton, A. M., Sadeghi, A. M., Zhang, X., Srinivasan, R., & Shirmohammadi, A. (2010). Using NEXRAD and Rain Gauge Precipitation Data for Hydrologic Calibration of SWAT in a Northeastern Watershed. Transactions of ASABE, 53(5), 1501-1510
- Veith, T. L., Van Liew, M. W., Bosch, D. D., & Arnold, J. G. (2010). Parameter sensitivity and uncertainty in SWAT: A comparison across five USDA-ARS watersheds. Transactions of the ASABE, 53(5), 1477-1485.
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- Williams, J. R. (1975). SEDIMENT ROUTING FOR AGRICULTURAL WATERSHEDS1. JAWRA Journal of the American Water Resources Association, 11(5), 965-974.
- Williams, J. R., & Berndt, H. D. (1977). Sediment yield prediction based on watershed hydrology. Transactions of the American Society of Agricultural Engineers, 20(6).

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment						Work Assignment Number 3-17			
						<input type="checkbox"/> Other <input checked="" type="checkbox"/> Amendment Number:			
Contract Number EP-C-12-060		Contract Period 09/30/2012 To 09/29/2017 Base Option Period Number 3			Title of Work Assignment/SF Site Name Big Spring Run Watershed Model				
Contractor TETRA TECH, INC.				Specify Section and paragraph of Contract SOW 2a and c					
Purpose: <input type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input checked="" type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval						Period of Performance From 01/04/2016 To 03/31/2016			
Comments: Full Title: Big Spring Run Watershed Modeling Hydrology & WQ									
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund									
SFO <input type="checkbox"/> Note: To report additional accounting and appropriations data use EPA Form 1900-69A. (Max 2)									
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars) (Cents)	Site/Project (Max 8)	Cost Org/Code
1									
2									
3									
4									
5									
Authorized Work Assignment Ceiling									
Contract Period:		Cost/Fee: \$0.00		LOE: 0					
09/30/2012 To 09/29/2017									
This Action:		\$5,107.00		50					
Total:		\$5,107.00		50					
Work Plan / Cost Estimate Approvals									
Contractor WP Dated: 01/27/2016				Cost/Fee \$5,107.00		LOE: 50			
Cumulative Approved:				Cost/Fee \$5,107.00		LOE: 50			
Work Assignment Manager Name Tim Canfield						Branch/Mail Code:			
						Phone Number: 580-436-8535			
						FAX Number:			
(Signature) _____ (Date) _____						Branch/Mail Code:			
Project Officer Name Ruth Corn						Phone Number: 513-569-7920			
						FAX Number:			
(Signature) _____ (Date) _____						Branch/Mail Code:			
Other Agency Official Name						Phone Number:			
						FAX Number:			
(Signature) _____ (Date) _____						Branch/Mail Code:			
Contracting Official Name Mark Cranley						Phone Number: 513-487-2351			
						FAX Number: 513-487-2109			
(Signature)  (Date) 02/24/16									

EPAUnited States Environmental Protection Agency
Washington, DC 20460**Work Assignment**

Work Assignment Number

3-19

☐ Other ☐ Amendment Number:Contract Number
EP-C-12-060

Contract Period 09/30/2012 To 09/29/2016

Title of Work Assignment/SF Site Name

Base Option Period Number 3

Support for Field-Based Criter

Contractor

TETRA TECH, INC.

Specify Section and paragraph of Contract SOW

2A; 2F

Purpose:



Work Assignment



Work Assignment Close-Out



Work Assignment Amendment



Incremental Funding



Work Plan Approval

Period of Performance

From 09/30/2015 To 09/29/2016

Comments:

Full Title: Support for Field-Based Criterion Research



Superfund

Accounting and Appropriations Data



Non-Superfund

SFO
(Max 2)

Note: To report additional accounting and appropriations data use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:

09/30/2012 To 09/29/2016

Cost/Fee:

LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated:

Cost/Fee:

LOE:

Cumulative Approved:

Cost/Fee:

LOE:

Work Assignment Manager Name Susan Cormier

(Signature)

(Date)

Branch/Mail Code:

Phone Number 513-569-7995

FAX Number:

Project Officer Name Ruth Corn

(Signature)

(Date)

Branch/Mail Code:

Phone Number: 513-569-7920

FAX Number:

Other Agency Official Name

(Signature)

(Date)

Branch/Mail Code:

Phone Number:

FAX Number:

Contracting Official Name Mark Crasley

(Signature)

(Date)

Branch/Mail Code: CPOD

Phone Number: 513-487-2351

FAX Number: 513-487-2109

PERFORMANCE WORK STATEMENT

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 3-19

TITLE: Support for Field-based Criterion Research

PERIOD OF PERFORMANCE: Award date through September 29, 2016

WORK ASSIGNMENT COR (WACOR):

Susan Cormier, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment
26 W. M. L. King Drive
Cincinnati, OH 45268
513-569-7034 (voice)
513-569-2540 (fax)
cormier.susan@epa.gov (email)

ALTERNATE WACOR:

Michael Griffith, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment
26 W. M. L. King Drive
Cincinnati, OH 45268
513-569-7034 (voice)
Griffith.michael@epa.gov

BACKGROUND:

The US Environmental Protection Agency's (EPA) Office of Research and Development (ORD), National Center for Environmental Assessment-Cincinnati (NCEA) provides guidance about how pollutants may impact our health and the environment. This is an important piece in the risk assessment process between the ORD bench scientist and EPA's program and regional office managers who are making regulatory, enforcement, and remedial-action decisions. In this regard, NCEA EPA is committed to developing information that is useful to state and tribal water quality managers in using field observations and models to develop methods and benchmarks to assess non-conventional pollutants such as specific conductivity and nutrients. To fulfill this mission, NCEA requires the expertise and support as described in the contract Performance Work Statement (PWS).

CWA Section 304(a) water quality criteria provide information to States and authorized Tribes in adopting water quality standards for protecting aquatic life and human health. Work performed under WA 2-19 investigated empirical field methods and examples associated with

the draft national field-based method and case studies regarding the aquatic toxicity of an ionic mixture dominated by sulfate, bicarbonate, calcium, and magnesium ions, as measured by specific conductivity. Under this work assignment, support is needed for research to advance the derivation of field-based methods to develop water quality benchmarks, models and criteria for the protection of aquatic life under research plan 3.02B and to assess and predict the ecological effects of wastewaters associated with energy and mineral extraction activities under research plan 303A. This work assignment is intended to serve as a general technical support work assignment.

NCEA has pioneered methods for deriving effect benchmarks for conductivity based on analysis of field data on benthic community composition and surface water quality. Work to be completed under ongoing efforts will include developing a background-to-criterion regression method to be used to calculate criteria nationally and to customize analyses for local geological settings and site-specific assessments. Also included are analyses to evaluate the sensitivity of the method to data quality (e.g., level of taxonomic identification), and methods to model geochemical background concentrations of major ions. There is a potential for expanding this field-based approach to benchmark development to other water quality variables (e.g., nutrients, suspended solids) and to distinguish effects from increased ionic concentration from those associated with habitat alteration and other stressors which also occur in association with resource extraction.

OBJECTIVES

The first objective of the work assignment is to provide greater transparency to the supporting analyses used to produce the draft conductivity criterion method and to make it easier to use the field-based method for developing criteria. The second objective is to develop new methods for estimating background and applying that information to the development of specific conductivity regions. The success of this effort will be based on the ability of EPA personnel to understand and repeat the analyses using the open source program R and Microsoft as described in Task 4 and the crafting of manuscripts that report the research details of the development process for the field-based methods.

QUALITY ASSURANCE

The tasks in this work assignment require the use of secondary data. The contractor shall use the QAPP submitted for WAX-05 (Support for Conductivity Benchmark Efforts) as updated in July 2014. All QA activities shall be in conformance with EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5) "<http://www.epa.gov/quality/qs-docs/r5-final.pdf>" and should demonstrate a clear understanding of the project's goals/objectives/questions and issues. Documentation of all analyses shall also indicate how types, quantity, quality of data have been quality assured and maintained. In particular, the quality assurance report shall also ensure that metadata is compiled in an easy to use format. All products should be detailed so that the decisions and analysis are completely transparent to a third party. The contractor shall alert the COR regarding any quality issues should they arise.

Consistent with the Agency's Quality Assurance (QA) requirements, the Quality Assurance Project Plan (QAPP), included as the July 2008 Attachment A and B (titled respectively, "Programmatic Quality Assurance Project Plan for the Use of Secondary Data" and

“QAPP Supplemental Requirements for Projects Using Secondary Data”) to the QMP, which have been provided to the contractor, will assure the quality of the work performed under this work assignment. The project specific quality assurance requirements must be addressed in the work plan and monthly progress reports as specified under Task 1. The QA activities should comprise no more than 10% of the total effort.

SCOPE OF WORK

The purpose of this work assignment is to obtain contractor services to address new or modified analyses to advance the use of field data for developing stressor response models primarily for ionic mixtures and support tools to enable states and tribes to readily use these methods. The specific tasks are defined below. Technical direction will be provided to the contractor for clarification purposes through written communication provided by the EPA WACOR using technical direction memoranda. Additional background and more details regarding the PWS are provided under the individual task descriptions. Any technical direction (verbal or written) shall be provided to the CL-COR/CO within 3 days.

Task 1: Prepare Work Plan, Monthly Progress Reports, and Comply with EPA Information Quality Guidelines

The contractor shall:

- a) Develop a work plan to address all tasks in this work assignment. The work plan shall include a schedule, staffing plan, level of effort (LOE), cost estimate, the contractor’s key assumptions on which staffing plan and budget are based, and qualifications of proposed staff. If a subcontractor(s) is proposed, the contractor shall include information on plans to manage work and contract costs. All P levels, hours and totals shall be provided and costs greater than \$100.00 must be itemized in detail. The contractor must provide the job number with all invoices to facilitate their expediency.

Work plan

Within 15 business days after receipt of work assignment

- b) Provide monthly progress and financial reports. The monthly progress report shall indicate, in a separate QA section, whether significant QA issues have been identified and how they are being resolved. Monthly financial reports shall include a table with the invoice LOE and costs broken out by the tasks in this WA.

Monthly Progress and
Financial Reports

Monthly

- c) Ensure the products developed under this work assignment comply with the EPA Information Quality Guidelines and shall complete the Checklist for Influential Information as needed for each deliverable from this work assignment as they may be used in Agency decision-making and/or will be publicly available documents. The contractor shall provide a memorandum describing how the planned product(s) developed meet EPA’s Information Quality Guidelines checklist. As part of that memo, the contractor shall document the quality assurance procedures it used in developing the

deliverables under this Work Assignment. If requested by the WACOR, the contractor shall provide the memo at the time it delivers the final revisions (Task 3b). As directed by the WACOR, the contractor shall meet with the WAM (through teleconference) to discuss the Guidelines and the contractor's role in completing the checklist.

Checklist for Influential
Information

Within 10 business days after call with
WACOR (if requested)

- d) Provide complete metadata for all manipulations of datasets, documentation of all figures, tables, and analyses performed in conjunction with the development of the public release conductivity criterion method including all appendices, and supporting analyses such as validation of fish assessment and temperature assessment. Datasets and corresponding data dictionaries used for all the analyses shall be provided as flat files (e.g., tab, or comma-delimited) as well as a data dictionary. Files shall be sorted into logical folders such as R-codes, excel work sheets, data sets, figures, tables, text and linked to a table of contents. The open source R-code should be split into separate preprocessing and analytic functions.

The contractor shall use the open source software "R" for statistical analyses unless otherwise specified with concurrence from the WACOR. Annotated code and data sets should be retained and submitted when providing results. Results and figures should be provided as code for the statistical package language that was used and in ppt, pdf, eps or other image software approved by the WACOR. Formulae for fitted lines should be provided.

Any spatial analysis, that is, the use of Geographic Information System (GIS) tools, functions, geoprocessing, and operations (e.g. map overlay, spatial query) of geographically-referenced data, shall include either a flow chart or model-builder steps that depict the data management and analysis of the GIS layers. If any scripts are used in the GIS analysis, those scripts should be annotated, retained, and submitted when providing results. Any maps produced from a GIS system shall include the source information of the data shown in the map and map projection, which may be in Adobe PDF files or ESRI format as dictated by technical direction. FGDC-compliant metadata shall be developed for any newly developed GIS datasets for use with this tool.

After the construction of the metadata pedigree, the contractor shall test the final product by having non-development personnel rerun all scripts.

Metadata of analyses

Within 30 business days after completion of
analyses

Task 2: Develop techniques for estimating exposure/effect benchmarks from field data

The contractor shall:

- a) Participate in a conference call with WACOR to clarify analyses necessary and work schedules for analyses.

Conference Call

Within 5 business days after receipt

technical directive.

- b) Perform technical tasks which may include additional analyses or modifications of existing analyses per Technical Directives (TD) and WACOR direction.

Completed Analyses

Within 25 business days after receipt of TD.

- c) Prepare a final report for the completion of manuscripts. Topics will include: Methods for field-based WQC, e.g., frequency, duration, maxima, and predictions from background; Factors influencing fish extirpation concentration, e.g., level of taxonomic identification.

Completed Report

Within 60 business days after completion of analyses

Task 3: Develop methods to weigh experimental, observational, and modeled relationships in WQC development

The contractor shall:

- a) Participate in a conference call with WACOR to clarify analyses necessary and work schedules for analyses.

Conference Call

Within 5 business days after receipt technical directive.

- b) Perform technical tasks which may include additional analyses or modifications of existing analyses per Technical Directives (TD) by WACOR direction.

Completed Analyses

Within 60 business days after receipt of TD.

- c) Prepare a final report for the completion of manuscripts. Topics will include: Improved methods for estimating background specific conductivity, Weight-of-evidence method for assessing least-disturbed background, an essential component of criterion derivation, Identification of conductivity regions based on a map and geographic shape files; report describing a weight-of-evidence method to evaluate relative confidence in field-based WQC using different exposure measures, assessment endpoints, data sets, and quantitative analyses

Completed Report

Within 60 business days after completion of analyses

Task 3: Completion of spreadsheet to calculate XC95, HC05, and CMEC

The contractor shall:

- a) Participate in a conference call with WACOR to clarify analyses necessary and work schedules for analyses.

Conference Call

Within 5 business days after receipt of TD.

- b) Perform technical tasks which may include additional analyses or modifications of existing analyses per Technical Directives (TD) by WACOR direction.

Completed Analyses Within 60 business days after receipt of TD.

- c) Prepare a final spreadsheet for the computing the XC95 values, HC05, and CMEC using a new data set or the B-C model. This work was begun under task 2-19 in 2015; however, the excel default interpolation was used instead of the actual 2-point interpolation. The final should contain the corrected formula and a section for calculating the HC05 from the B_C model as well as upper and lower prediction limits. Depending on the success of this effort a more sophisticated version may be developed in R-code that includes bootstrapping of confidence intervals.

Completed Report Within 60 business days after completion of analyses

Technical Expertise Required for Key Contractor Staff:

The key technical individual(s) must have experience with aquatic life criteria document development, may require biostatistics (particularly R and writing and reviewing code), water chemistry as it relates to ionic concentration and effects on aquatic life, and the relevant body of literature.

Deliverables and Schedule

Task 1a	Prepare Workplan	Within 15 business days after receipt of work assignment
Task 1b	Monthly Progress and Financial reports	Monthly as described
Task 1c	Checklist for Influential Information and memorandum on quality assurance procedures	Within 10 business days after call with WACOR(if requested)
Task 1d	Provide complete metadata of all analyses	Within 30 days of completion of each report
Task 2a	Conference call with WACOR	Within 5 business days of receipt of work assignment
Task 2b	Technical analyses	Within 25 business day of conference call or TD from WACOR
Task 2c	Final reports on methods for developing field-based benchmarks and criteria	Within 60 business day of conference call or TD from WACOR
	Minor review and potential re-formatting of the document prior to submission for clearance or	Due 10 business days after TD from WACOR

	publication	
Task 3a	Conference call with WACOR	Within 3 business days of receipt of work assignment
Task 3b	Draft analyses	Within 25 business day of conference call or TD from WACOR
Task 3c	Final reports on improving estimates or background and weight of evidence methods	Within 60 business day of conference call or TD from WACOR
Task 3d	Minor review and potential re-formatting of the document prior to submission for clearance or publication	Due 10 business days after TD from WACOR
Task 4a	Conference call with WACOR	Within 3 business days of receipt of work assignment
Task 4b	Draft analyses	Within 25 business day of conference call or TD from WACOR
Task 4c	Spreadsheet to calculate XC95, HC05, and CMEC	Within 60 business day of conference call or TD from WACOR
Task 4d	Minor review and potential re-formatting of the spreadsheet	Due 10 business days after TD from WACOR

ACCEPTANCE CRITERIA

The Contractor shall prepare high quality products and that are reproducible and transparent. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

TRAVEL

No travel is anticipated for this work assignment.

SPECIAL REPORTING REQUIREMENTS

Following Work Assignment approval, the Contractor WAL shall maintain communication with the EPA WACOR on a biweekly basis through email, telephone, or in writing. The contractor shall contact the work assignment manager by phone with any questions or problems as soon as they arise to ensure rapid resolution. Any technical direction must be documented and a copy sent to the CL-COR and the Contracting Officer.

Written monthly progress reports must be detailed, split into specific tasks to support billings, and document any/all QA/QC procedures performed during the reporting period.

The contractor shall provide the EPA WACOR, either electronically (pdf format) or by fax, any/all documents submitted as deliverables.

Copies of the final report will be submitted in electronic form, with electronic word processing, spreadsheet, statistical and graphics files submitted in software format designated by the EPA WACOR.

CONFLICT OF INTEREST

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

MANAGEMENT CONTROLS

1. The EPA will review and provide comments on the Work Plan and QAPP.
2. The EPA will also review and provide comments on the subsequent module outlines, module drafts, and conceptual models for each of the candidate causes.
3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.
4. Technical Direction: The WACOR is authorized to provide technical direction that clarifies the PWS as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WACOR within four working days of verbal issuance. This will be forwarded to the CL-COR and CO for their information and necessary actions.

The CO is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the CO in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the PWS, as well as comments and approval of reports and other deliverables

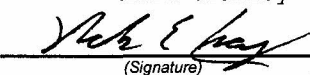
NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the CL-COR or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA United States Environmental Protection Agency Washington, DC 20460 Work Assignment		Work Assignment Number 3-19 <input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:								
Contract Number EP-C-12-060	Contract Period 09/30/2012 To 09/29/2016 Base Option Period Number 3	Title of Work Assignment/SF Site Name Support for Field-Based Criter								
Contractor TETRA TECH, INC.		Specify Section and paragraph of Contract SOW 2A; 2F								
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input checked="" type="checkbox"/> Work Plan Approval		Period of Performance From 09/30/2015 To 09/29/2016								
Comments: Full Title: Support for Field-Based Criterion Research										
<input type="checkbox"/> Superfund Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
SFO (Max 2) <input type="checkbox"/> Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period: 09/30/2012 To 09/29/2016		Cost/Fee: \$0.00				LOE: 0				
This Action:		\$0.00				0				
Total:		\$143,213.00				1,524				
Work Plan / Cost Estimate Approvals										
Contractor WP Dated: 10/22/2015		Cost/Fee: \$0.00				LOE: 0				
Cumulative Approved:		Cost/Fee: \$143,213.00				LOE: 1,524				
Work Assignment Manager Name Susan Cormier <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>						Branch/Mail Code: Phone Number 513-569-7995 FAX Number:				
Project Officer Name Ruth Corn <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>						Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:				
Other Agency Official Name <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>						Branch/Mail Code: Phone Number: FAX Number:				
Contracting Official Name Mark Cranley <div style="display: flex; justify-content: space-between;"> <div>  (Signature) </div> <div>11/13/15 (Date)</div> </div>						Branch/Mail Code: CP0D Phone Number: 513-487-2351 FAX Number: 513-487-2109				